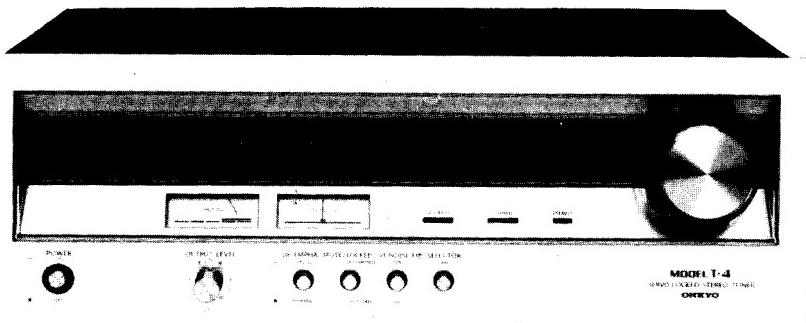


# ONKYO® SERVICE MANUAL

## SERVO LOCKED AM/FM STEREO TUNER

### Model T-4



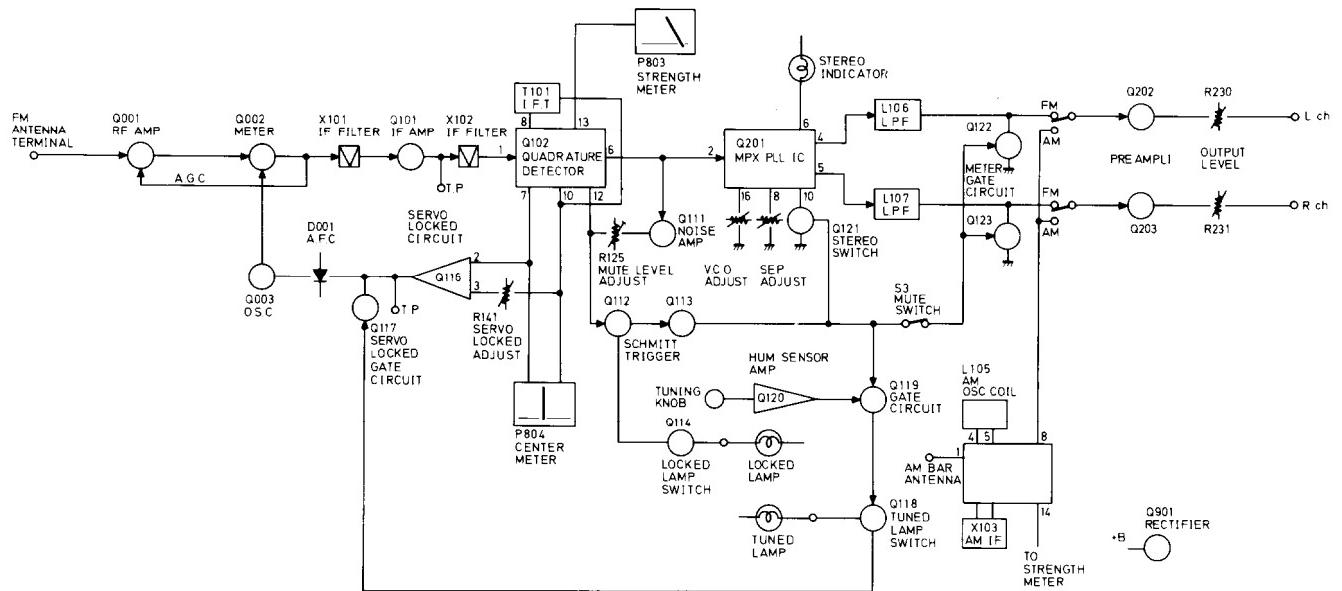
#### SPECIFICATIONS

Tuning Range	FM: 88 ~ 108MHz AM: 530 ~ 1605kHz	Harmonic Distortion	FM Stereo: 0.4% AM: 0.8%
Usable Sensitivity	FM Mono: 10.8dBf (1.9μV) FM Stereo: 18.3dBf (4.5μV) AM: 25μV	Stereo Separation	FM: 40 dB at 1kHz 30 dB from 100Hz to 10kHz
50dB Quieting Sensitivity	FM Mono: 16.1dBf (3.5μV) FM Stereo: 37.2dBf (40μV)	Sub Carrier Suppression	FM: 60 dB
Intermediate Frequency	FM: 10.7 MHz AM: 455 kHz	Muting Level	FM: 17.2dBf (4μV)
Capture Ratio	FM: 1.5 dB	Stereo Threshold	FM: 17.2dBf (4μV)
Image Rejection Ratio	FM: 60 dB AM: 40 dB	Servo Locked Level	FM: 17.2dBf (4μV)
IF Rejection Ratio	FM: 90 dB AM: 30 dB	Frequency Response	FM: 30Hz~15kHz (+0.5, -2 dB)
Spurious Rejection	FM: 85 dB	Output Voltage	FM: 0 ~ 1V AM: 0 ~ 0.3V
S/N Ratio	FM Mono: 70 dB FM Stereo: 60 dB AM: 40 dB	<b>General</b>	
Alternate Channel Attenuation	FM: 60 dB	Power Supply	AC 120V (60Hz)
AM Suppression Ratio	FM: 50 dB	Power Consumption	11W
Harmonic Distortion	FM Mono: 0.2%	Semiconductors	5 ICs, 1 FET, 16 transistors, 24 diodes
		Dimensions	6½"(H) x 17½"(W) x 15"(D) 159(H)x444(W)x380(D)mm
		Weight	13.4 lbs. (6.1 kg.)

Specifications and features are subject to change without notice.

**ONKYO®**  
**AUDIO COMPONENTS**

## BLOCK DIAGRAM



### Automatic Servo Locked Tuning System

The outstanding feature of this high quality stereo tuner is the Servo Locked Tuning System. FM stations are tuned immediately, automatically, and accurately, without the slightest fine tuning adjustment required at all. Simply tune approximately to the desired FM station, and then let go. The automatic servo locked tuning circuit does the rest, fine tuning the station with uncanny electronic precision. The station remains firmly "locked" for as long as you want without the slightest hint of station drift — a great advantage during important recording sessions.

### "Human Touch Sensor" Tuning Knob

An essential part of the Servo Locked Tuning System is the tuning knob itself, connected to a special sensor circuit. When your hand touches the tuning knob to tune to the desired station, the servo locked tuning circuit is temporarily "disconnected". But when you let go of the tuning knob, after tuning approximately to the FM station, the servo locked tuning circuit is reactivated via the special sensor circuit, locking the station to dead center tuning. No fine tuning adjustments are required since the servo lock system automatically compensates for tuning differences.

### FET Front End

High sensitivity matched by minimal intermodulation distortion has been achieved by equipping the front end with a high grade FET (field-effect transistor).

### Phase Locked Loop Stereo Decoder IC

The broadcasting station pilot signal plus a switching signal generated in the MPX (stereo decoder) circuit, are locked in a PLL circuit (enclosed in a specially designed IC) thereby ensuring excellent stereo separation, and a very low distortion level. This IC also features better frequency response and low carrier leak.

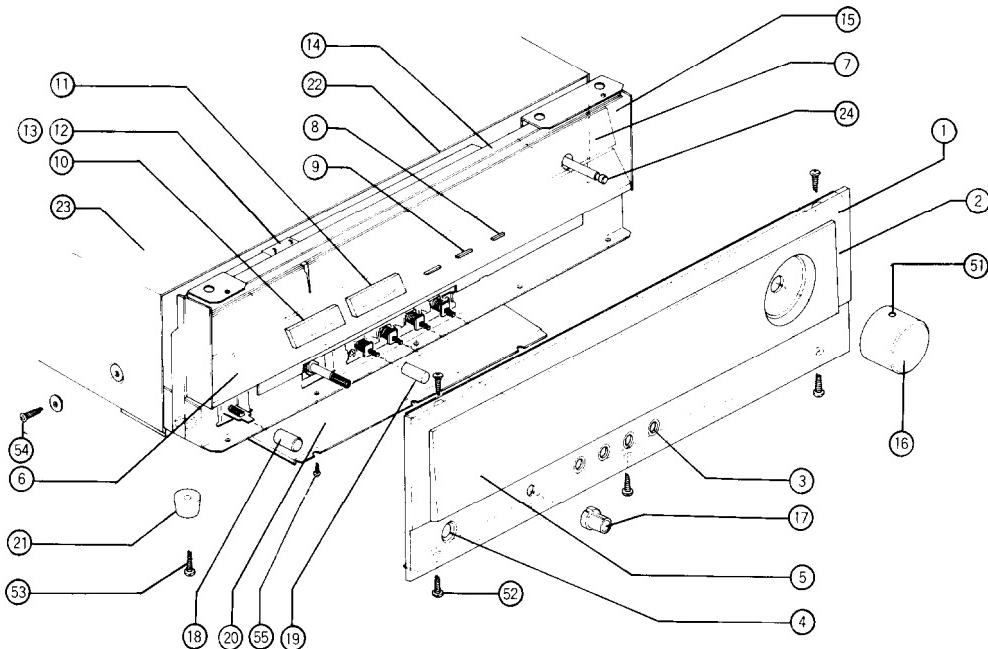
### Epoxy PC Board FM Oscillator Circuitry

All FM oscillator elements are on epoxy PC board to ensure drift-free stability in oscillator frequency despite changes in temperature and humidity.

### De-Emphasis Switch

De-emphasis is normally set to NORMAL (75  $\mu$ sec), but for reception of FM Dolby broadcasts switch to the 25  $\mu$ sec position.

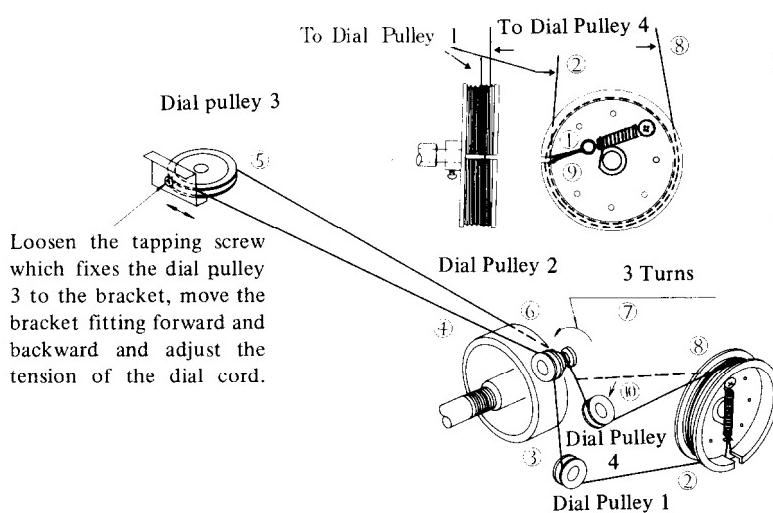
## EXPLODED VIEW



## PARTS LIST

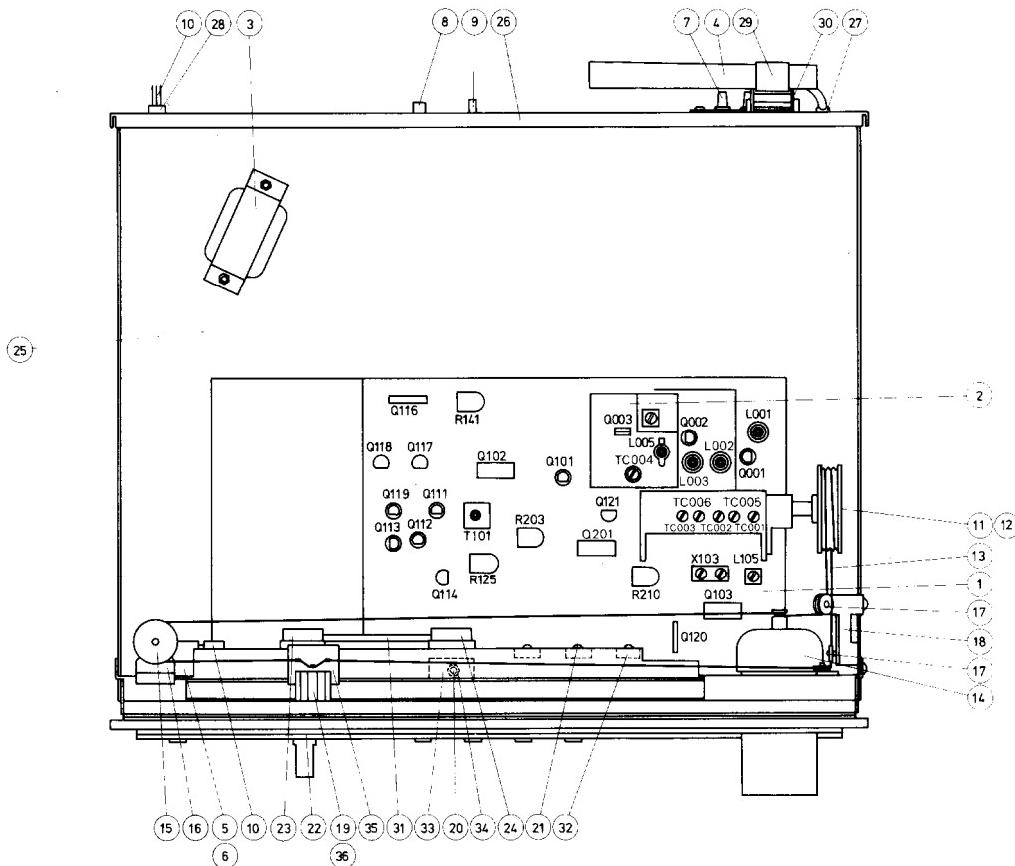
REF. NO.	PARTS NO.	DESCRIPTION	REF. NO.	PARTS NO.	DESCRIPTION
1	13729121	Front Panel Ass'y	17	28320157	LEVEL Knob
2	27210089	Front Panel	18	28320159	POWER Knob
3	27267014	Push Knob Guide	19	28320160	Push Knob
4	27267015	Power Knob Guide	20	27170020	Bottom Board
5	28191015	Dial Glass	21	280379	Leg
6	27210068	Decorative Plate M	22	28140024	Cushion
7	28130081A	Dial Plate	23	28184018A	Top Cover
8	28198503	Facet	24	27205007A	Drive Shaft
9	28198504	Facet			Screws
10	243066A	NIND-0500S66, Strength Meter	51	801146	Enamel Screw
11	243067A	NIND-0250S67, Tuning Meter	52	834130062	3STS+6BQ
12	210015A	PL6.3V 50mA W3UL Red, Pointer Lamp	53	832140122	4STR+12BQ
13	28165039	Pointer	54	838440109	4TTB+10C(BC)
14	28194025	Decorative Bar	55	831130082	3STW+8BQ
15	27215017-1	End Cap			
16	28320156	TUNING Knob			

## STRINGING DIAGRAM



1. Close the variable capacitor complete and tie dial cord to the spring of the dial drum.
2. Thread dial cord in the direction of arrow from ① to ⑥ and wind dial cord three turns around the tuning shaft clockwise.
3. Thread dial cord in the direction of arrow from ⑦ to ⑨.
4. Thread dial cord to the dial pulley 4.

## **COMPONENT LOCATION**



## PARTS LIST

REF. NO.	CIRCUIT NO.	PARTS NO.	DESCRIPTION	REF. NO.	CIRCUIT NO.	PARTS NO.	DESCRIPTION
1	U1	13729546	NARF-446, AM/FM tuner p.c.b.	19	PL801	210015A	6.3V 50mA, Pointer light
2		13729547	NAOSC-447, Oscillator p.c.b.	20	PL802, PL803	210015A	6.3V 50mA, Meter light
3	T901	230196A	NPT-609D, Power transformer	21	PL804~PL806	210030	6V 30mA Locked, Tuned/ Stereo indicator light
4	L801	232061	NMA-1006, AM bar antenna				
5	S901	25035047	NPS-111-L12P, Power switch	22	R230	5147005	N16RG10KB35, Output level
6	C901	3504012	0.01μF 125V, UL Capacitor				volume
7	P801	25060020	NTM-3WPUN1, Antenna terminal	23	P803	243066A	NIND-0500S66, Strength meter
8	P802	25045026	NPJ-2PRBL04, Output terminal	24	P804	243067A	NIND-0250S67, Center meter
9	S801	25065016	NSS-2327, Hum sensor slide switch	25	A001	27100018C	Chassis
				26	A070	27120102	Back panel
				27	A072	270280	SR-4K-4, Strainrelief
10	W901	253072	AS-UC, Power supply cord	28	A071	270025	SR-3P-4, Strainrelief
11	A006	27200020	Dial drum	29	A073	27140091	Antenna bracket
12	A008	273803	SP-14A, Dial drum spring	30	A074	27190021	Antenna holder
13	A009	273903	Dial cord	31	A037	27140126	Bracket
14	A027	27205007	Drive shaft	32	A043	270214-1	Lamp cover
15	A032	27185001	DP-26, Dial pulley	33	A044	27190022-1	Lamp holder
16	A031	27140125A	Bracket	34	A045	28330020	Lam cap
17	A016	27185002	DP-16, Dial pulley	35	A047	28165039	Pointer
18	A015	27140124	Bracket	36	A048	28330020	Lamp cap

# ALIGNMENT PROCEDURES

## INSTRUMENTS REQUIRED

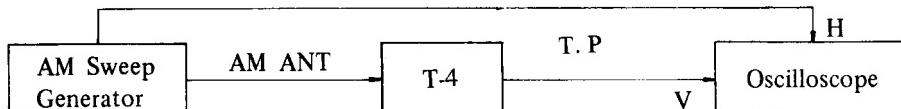
1. AM Sweep Generator
2. AM and FM Signal Generator
3. Vacume Tube Voltage Meter (VTVM) AC, DC
4. Oscilloscope
5. Distortion Analyzer
6. Stereo Modulator
7. Frequency Counter

## GENERAL ALIGNMENT CONDITIONS

1. Signal input should be kept as low as possible.
2. Standard modulation is 400Hz 30 % (AM), 400Hz 100 % (FM MONO) pilot 10 % sub and main 90 % (FM STEREO).

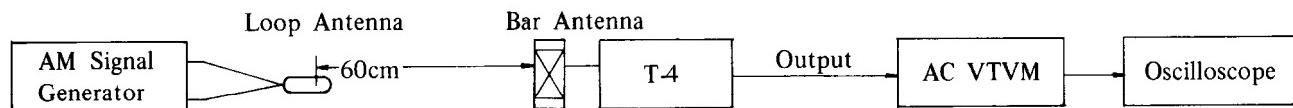
### (1) AM IF ALIGNMENT

1. Set SELECTOR switch to AM.
2. Set radio dial to quiet point.



Set signal	Adjust	Oscilloscope	Remarks
455 KHz	X103 (CFT-455B)	Maximum Symmetrical Response	Usually not necessary to adjust

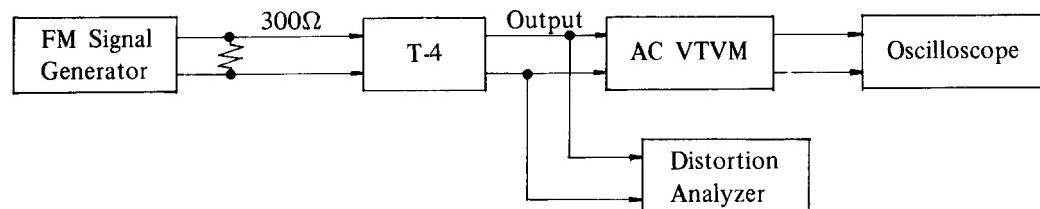
### (2) AM RF ALIGNMENT



Step	Set Signal	Set Radio Dial	Adjust	VTVM reading	Remarks
1	515 KHz 400 Hz 30 %	Lower end (515 KHz)	L105 NMO-2002	Maximum	Repeat step 1 and 2 as necessary
2	1680 KHz 400 Hz 30 %	Upper end (1680 KHz)	TC-006	Maximum	
3	600 KHz 400 Hz 30 %	600 KHz	L801 NMA-1006	Maximum	Repeat step 3 and 4 as necessary
4	1400 KHz 400 Hz 30 %	1400 KHz	TC-005	Maximum	

### (3) FM FRONT END ALIGNMENT

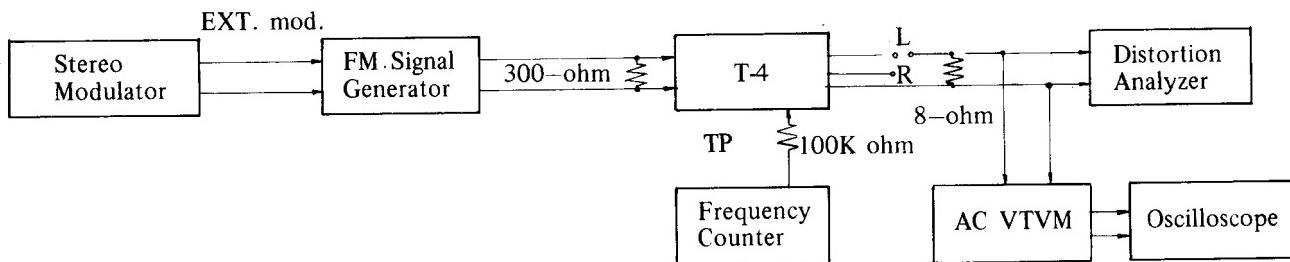
1. Set SELECTOR switch to FM.
2. Push MUTING switch to off.
3. Connect FM Signal Generator to 300-ohm antenna terminals.
4. Connect DC Voltmeter to TP-1 terminals.



Step	FM Signal Generator	Dial to set	Adjust	Output Indicator	Adjust for	Remarks
1	No signal	Quiet Point	T101 Bottom	DC Voltmeter	OV	Repeat step 1 and 2 as necessary.
2	98 MHz 60 dB 400 Hz 100% mod.	98 MHz	T101 Top	Distortion Analyzer	Minimum	
3	90 MHz 60 dB 400 Hz 100% mod.	90 MHz	L005 OSC Coil NFO-3003	AC VTVM or Oscilloscope	Maximum	Repeat step 5 and 4 as necessary.
4	106 MHz 60 dB 400 Hz 100% mod.	106 MHz	TC004		Maximum	
5	90 MHz 400 Hz 100% mod.	90 MHz	L001, L002, L003		Maximum	Repat step 5 and 6 as necessary.
6	106 MHz 400 Hz 100% mod.	106 MHz	TC001 TC002, TC003		Maximum	
7	98 MHz 400 Hz 100% mod.	98 MHz	T001 NIT-0518		Maximum	

NOTES: When adjust step 5 and 6, set FM Signal Generator level as low as possible.

#### (4) FM MONO DISTORTION AND MULTIPLEX ALIGNMENT



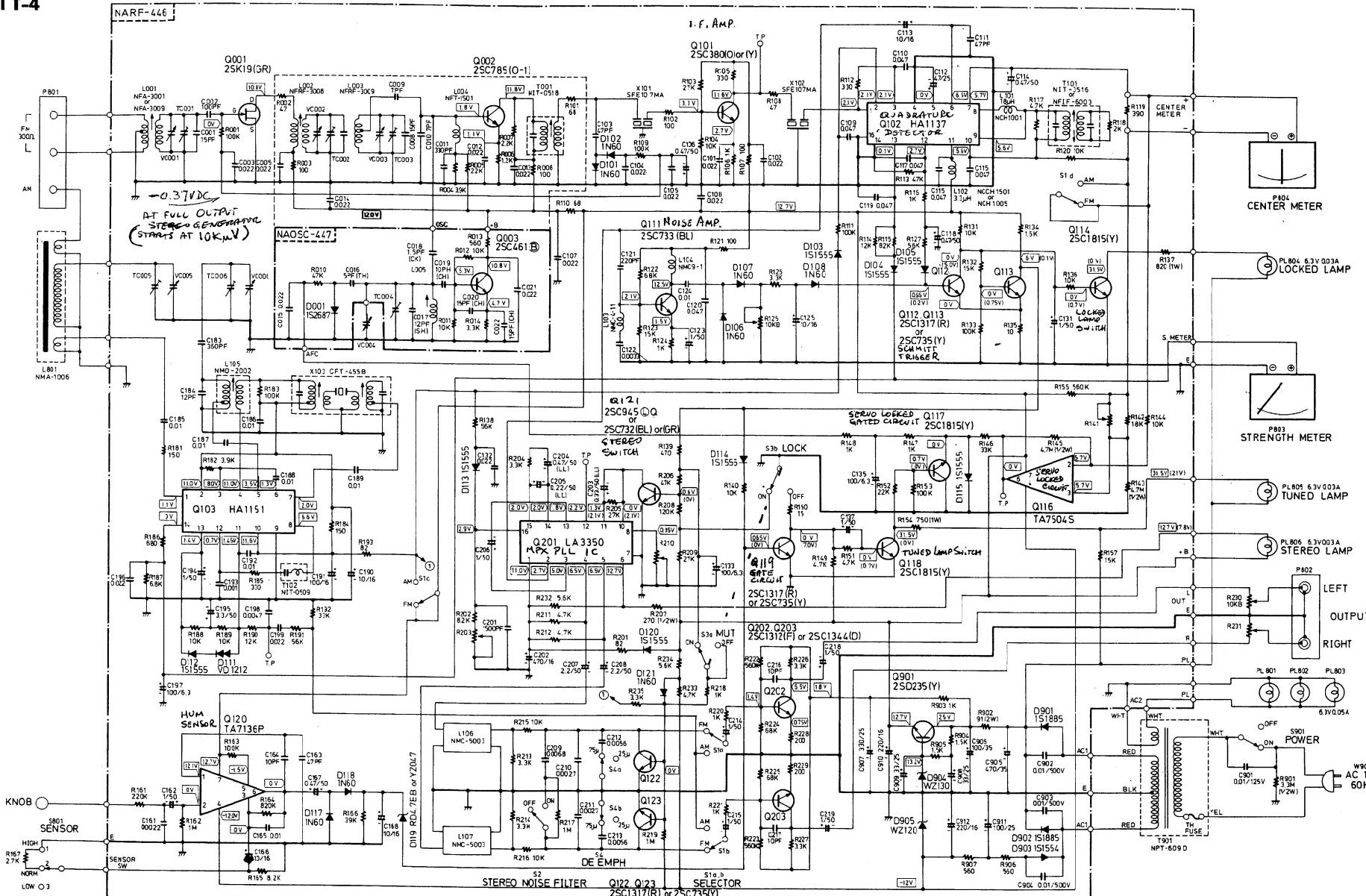
Alignment	Step	FM Signal Generator	Stereo Modulator	Dial to set	Adjust	Output Indicator	Adjust for	Remarks
Mono Distortion		98 MHz 400 Hz 100% mod. 60 dB		98 MHz	T101 Bottom	Distortion Analyzer	Minimum	
19 KHz	1	98 MHz 400 Hz no mod. 60 dB		98 MHz	R203	Frequency Counter	$19000 \pm 19$ Hz	
	2	STEREO INDICATOR should light up when stereo program is being received.						
Multiplex	1	98 MHz EXT. Mod.	Pilot Sig. 10% Main & Sub Sig. 1 KHz Lch 90%	98 MHz	R210	AC VTVM Right ch.	Minimum	Repeat step 1 & 2 as necessary
	2	Same as above	Pilot Sig. 10% Main & Sub Sig. 1 KHz Rch 90%	98 MHz	R210	AC VTVM Left ch.	Minimum	

#### (5) SERVO LOCKED ALIGNMENT

Step	FM Signal Generator	Dial to set	Adjust	Muting switch	Indicator	Adjust for
1	98 MHz 400 Hz 100% mod. 60 dB	98 MHz	Dial	OFF	TUNING METER	Center
2	Same as above	98 MHz	R141	ON	TUNING METER	Center

# SCHEMATIC DIAGRAM

Model T-4



**SWITCH**  
 S1 (a,b,c,d) (AM-FM SELECTOR)  
 S2 (a,b) (STEREO NOISE FILTER)  
 (MUTING, LOCK, MODE)  
 S4 (a,b) (DE EMPH.)  
 S801 (HUM SENSOR)  
 S901 (POWER)

**NOTES**  
 ALL RESISTORS ARE IN OHMS, 1/4 WATT UNLESS OTHERWISE NOTED.  
 ALL CAPACITORS ARE IN  $\mu$ F, 50V UNLESS OTHERWISE NOTED.  
 ELECTROLYTIC CAPACITORS (-) ARE IN  $\mu$ F/WV.  
 VOLTAGE (MEASURED WITH V.T.V.M.) DC VOLTAGE.  
 [V] (NO INPUT SIGNAL), (v) (FM STEREO).

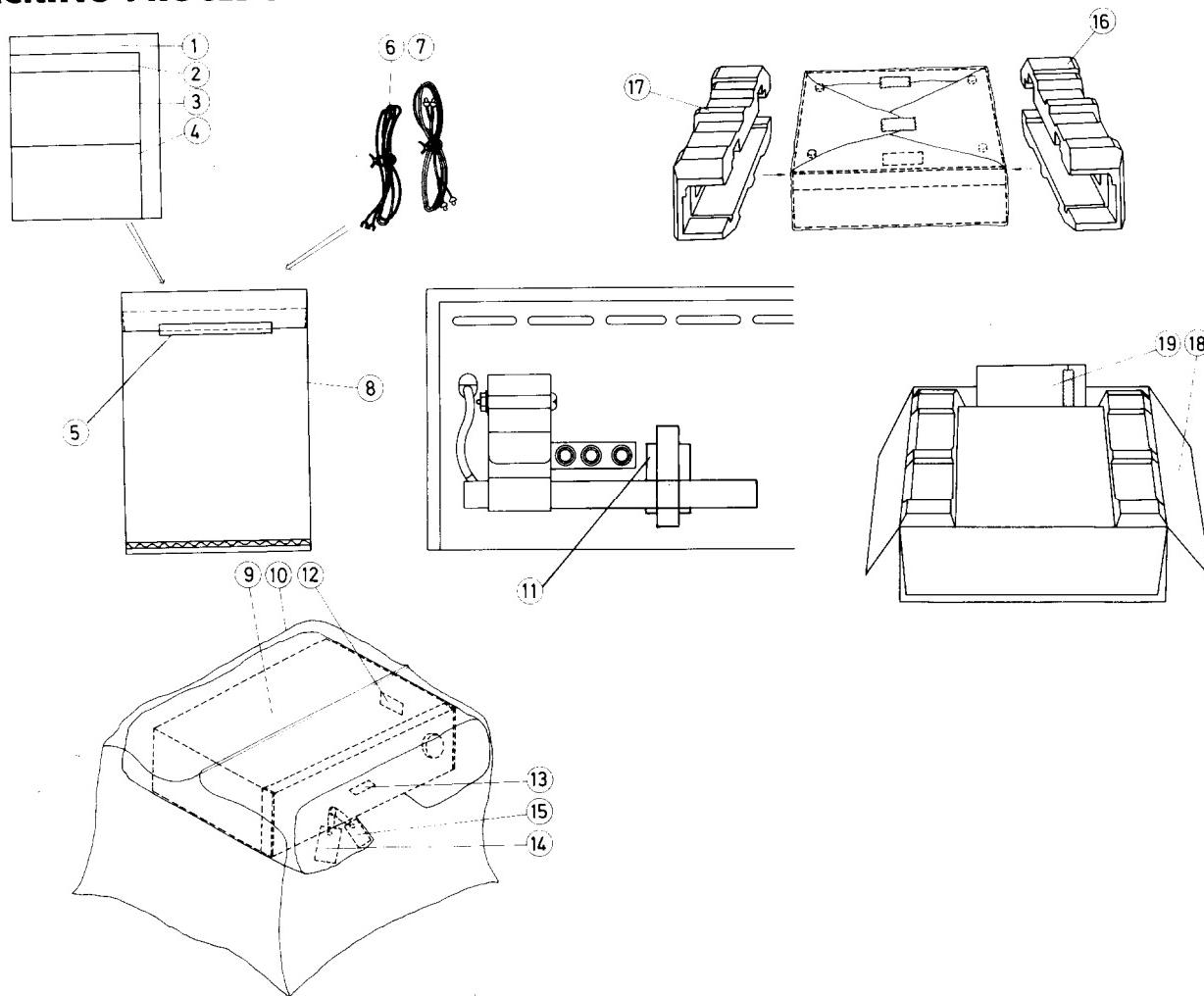
ECB  
 2SC1317  
 2SC1815  
 2SC785  
 2SC380  
 2SC461  
 2SC1344  
 2SD235  
 2SD132  
 2SK19  
 2SC732  
 2SC733  
 2SC735  
 HA1137  
 LA3350  
 HA1151  
 TA7136P

ONKYO CORPORATION

# AM/FM TUNER PC BOARD (NARF-446) – PARTS LIST

CIRCUIT NO.	PARTS NO.	DESCRIPTION	CIRCUIT NO.	PARTS NO.	DESCRIPTION
<b>TRANSISTORS</b>					
Q001	2210374	2SK19GR(O-1), RF amp. F.E.T.	VC001	3050006	NVC-20FQ327WD02, Variable
Q002	2210380	2SC785(O-1), Mixer	C106, C114,	352784791	0.47μF 50V, Elect.
Q101	2210123	2SC380(O)	C118	352750471	4.7μF 25V, Elect.
	2210124 or	2SC380(Y) or FM IF amp.	C112	352741001	10μF 16V, Elect.
Q111	2210086	2SC733(BL), Noise amp.	C113, C125	352741001	10μF 16V, Elect.
Q112, Q113	2210943	2SC1317(R) or Schmitt trigger	C123, C131,	352780101	1μF 50V, Elect.
	2210244 or	2SC735(Y)	C137	352741011	100μF 16V, Elect.
Q114	2211254	2SC1815(Y), Locked lamp switch	C133	352721011	100μF 6.3V, Elect.
Q117	2211254	2SC1815(Y), Servo locked switch	C135, C197	352780101	1μF 50V, Elect.
Q118	2211254	2SC1815(Y), Tuned lamp switch	C162, C194	352741001	10μF 16V, Elect.
Q119	2210943	2SC1317(R)	C166, C168	352741001	0.47μF 50V, Elect.
	2210244 or	2SC735(Y) or Gate circuit	C167	352784791	360pF ±50% 50V, ST
Q121	2210745	2SC945(L)Q or Stereo switch	C183	372323614	10μF 16V, Elect.
	2210045 or	2SC732(BL)	C190	352741001	100μF 16V, Elect.
Q122, Q123	2210943	2SC1317(R) or Muting switch	C191, C202	352741011	3.3μF 50V, Elect.
	2210244 or	2SC735(Y)	C195	392883397	1500pF ±10% 50V, ST
Q202, Q203	2210943	2SC1317(R) or AF amp.	C201	392884797	0.33μF 50V, LL
	2210244 or	2SC735(Y)	C203	392882297	0.47μF 50V, LL
Q901	2200014	2SD235(Y), Voltage regulator	C204	392882297	0.22μF 50V, LL
<b>ICS</b>					
Q102	222421	HA-1137, Quadrature detector	C207, C208	352780221	1μF 50V, Elect.
Q103	222418	HA-1151, AM	C214, C215	352780101	2.2μF 50V, Elect.
Q116	222424	TA7504S, Servo locked amp.	C218, C219	352764711	470μF 35V, Elect.
Q120	222423	TA7136P, Hum sensor amp.	C905	352761011	100μF 35V, Elect.
Q201	222449	LA3350, Multiplex PLL	C906	352753311	330μF 25V, Elect.
<b>DIODES</b>					
D101, D102,			C907	352753301	33μF 25V, Elect.
D106, D107,			C910, C912	352742211	220μF 16V, Elect.
D108, D117	223103	1N60	C911	352751011	100μF 25V, Elect.
D118, D121			<b>VARIABLE RESISTORS</b>		
D103~D105,			R125	5225017	N10HR10KBC
D120,	223105	1S1555	R141	5225013	N10HR100KBC
D112~D115			R203	5225056	N10HR 5KBC
D111	4000022	VD1212, Varistor	R210	5225018	N10HR1KBC
D119	223943	RD4.7EB or Zener	<b>METAL OXIDE FILM RESISTORS</b>		
	224011 or	YZ047	R137	441628214	820Ω 1W
D901, D902	223802	1S1885	R154	441627514	750Ω 1W
D903	223106	1S1554	R902	441729104	91Ω 2W
D904	223924	WZ130, Zener	<b>PUSH SWITCH</b>		
D905	223910	WZ120, Zener	S1~S4	25035062	NPS-322-142-L27
<b>COILS</b>					
L001	233106	NFA-3009 or FM RF	<b>SHIELDED CASE</b>		
	233088-1 or	NFA-3001 or FM RF	27225022	Front end block	
L002	233112	NFRF-3008, FM RF	<b>OSCILLATOR PC BOARD</b>		
L003	233113	NFRF-3009, FM RF	<b>(NAOSC-447) – PARTS LIST</b>		
L004	233037	NFT-1501, Trap	CIRCUIT NO.	PARTS NO.	DESCRIPTION
L101	233098	NCH-1001, Choke	Q003	2211342	2SC461B, Oscillator transistor
L102	233105	NCH-1005 or Choke	D001	223110	1S2687, Variable capacitor diode
	233024 or	NCCH-1501	L005	233090	NFO-3003, Oscillator coil
L103	233018	NMC-4-11	TC004	3060003	NTC-10P02, Trimmer capacitor
L104	233031	NMC-9-1		27150071	Shielded case
L105	232065	NMO-2002, AM OSC			
L106, L107	233110	NMC-5003, Low pass filter			
<b>TRANSFORMERS</b>					
T001	233085	NIT-0518, FM IF			
T101	233083	NIT-3516			
	233101 or	NFIF-6003 or			
T102	232041	NIT-0509			
<b>CERAMIC FILTERS</b>					
X101, X102	3010003	SFE10.7MA			
X103	3010012	CFT455B			

## PACKING PROCEDURES



1. All printed material and accessory items are placed in the poly bag.
2. The pad is inserted between the AM bar antenna and the back panel.
3. The sensor switch is set to low position.
4. The cabinet composite tag and sensor tag are attached to the output level control knob.

## PARTS LIST

REF. NO.	PARTS NO.	DESCRIPTION	REF. NO.	PARTS NO.	DESCRIPTION
1	29340244	Instruction Manual	11	29090230	Pad
2	29358001	Service Station List	12	282969	Caution Label A
3	29355046	Caution Card for Warranty Card	13	293041	Caution Label
4	29365003	Warranty Card	14	29380025	Cabinet Composite Tag
5	261504	Adhesive tape	15	29355045	Sensor Tag
6	292064	5059-01, FM Antenna	16	29090178	Pad, Left
7	253074	Connection cord	17	29090179	Pad, Right
8	29100006A	250x350mm, Poly Bag	18	29050158	Carton Box
9	290008	500x1000mm, Sheet	19	13729119	Accessory Bag Complete
10	29100027	850x650mm, Poly Bag			

## ONKYO CORPORATION

International Division: No. 24 Mori Bldg., 23-5, 3-chome, Nishi-Shinbashi, Minato-ku, Tokyo, Japan.  
Telex 2423551 ONKYO J. Phone 03-432-6981

### ONKYO U.S.A. CORPORATION

#### Eastern Office

42-07 20th Avenue, Long Island City, New York 11105, U.S.A. Phone (212) 728 4639

#### Midwest Office

935 Sivert Drive, Wooddale, Illinois 60191, U.S.A. Phone (312) 595-2970